NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

ARE WE HOPING FOR A BOUNCE? A STUDY ON RESILIENCE AND HUMAN RELATIONS IN A HIGH RELIABILITY ORGANIZATION

by

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March 2016

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REPORT DOCUMENTATION PAGE		*Form Approved OMB No. 0704–0188*

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.

1. AGENCY USE ONLY *(Leave blank)*	**2. REPORT DATE** March 2016	**3. REPORT TYPE AND DATES COVERED** Master's thesis	
4. TITLE AND SUBTITLE ARE WE HOPING FOR A BOUNCE? A STUDY ON RESILIENCE AND HUMAN RELATIONS IN A HIGH RELIABILITY ORGANIZATION		**5. FUNDING NUMBERS**	
6. AUTHOR(S) Robert D. Johns			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000		**8. PERFORMING ORGANIZATION REPORT NUMBER**	
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A		**10. SPONSORING / MONITORING AGENCY REPORT NUMBER**	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB Protocol number NPS.2015.0007-AM03-EP6&7-A			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited		**12b. DISTRIBUTION CODE**	

13. ABSTRACT (maximum 200 words)

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14. SUBJECT TERMS resilience, high reliability organization, leadership, relational coordination, social support, psychological safety, cohesion, organizational effectiveness			**15. NUMBER OF PAGES** 73
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UU

NSN 7540–01-280-5500

Standard Form 298 (Rev. 2–89)
Prescribed by ANSI Std. 239–18

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ARE WE HOPING FOR A BOUNCE? A STUDY ON RESILIENCE AND HUMAN RELATIONS IN A HIGH RELIABILITY ORGANIZATION

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MASTER OF SCIENCE IN MANAGEMENT

from the

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ABSTRACT

This study analyzes the various resilience factors associated with a military high reliability organization (HRO). The data measuring organizational resilience was gathered from surveys aboard a US Naval vessel in March and October of 2015. A review of the surveys determined that there were potential differences in levels of resilience across the enlisted and officer ranks within the organization. A multiple linear regression model was used to search for any significant effects of rank on psychological safety. The findings confirmed that the leadership ranks of E4 to E6 reported lower rates of psychological safety. The study also found moderating effects on rank and psychological safety, such as identification as a sailor and identification with their division. The data analyzed in this project suggests that the organization should promote and support psychological safety through processes and cultural changes. Specific tools that could be used include positive socialization of newly arriving members and the use of "good catch logs" to reinforce the organization's high reliability culture.

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ACKNOWLEDGMENTS

My early military experiences affected the way in which I interpreted and responded to new challenges. These responses depended upon my attitude, confidence, and expectations that were learned by a series of diverse experiences. These numerous and varied experiences have molded me into the person that I have become. As a result, I am very thankful to all the individuals who have given me the endless opportunities and skills to thrive throughout my U.S. Navy career.

A special acknowledgement goes to my beautiful wife, who has repeatedly endured my absence during my 25 years of service to our country, and extended family members who spent countless hours supporting me throughout this project. Also, a special acknowledgement goes to my thesis advisors, Dr. Edward H. Powley and Dr. Frank J. Barrett, who have given me the knowledge and tools to better understand the concept of resilience and how to create a fruitful environment for co-workers and future leaders.

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I. INTRODUCTION

A. BACKGROUND

Many organizations are required to operate as an error-free system. This most often is due to the environment in which they operate. If an error does occur it could result in a major catastrophe or loss of life (Weick & Roberts, 1993, p. 357). The individuals that function within this system do what is required of them regardless of the situation and the stability of their environment. The organization's culture contributes greatly to the environment in which it operates. Some of these environmental dynamics include external demands placed upon the organization, financial restraints, and social forces. There is a limited amount of resources to manage these dynamics. How the organization chooses to coordinate these resources and create task interdependence impacts its resilience (Gittell, 2002).

Military entities often have difficulties adapting to new environments due to the rigidity of its mechanistic structure. The ability to share information and temporarily adopt an organic structure is crucial to adjusting to new situations and becoming a more resilient organization (Weick & Roberts, 1993, p. 377). A way to avoid errors and increase organizational resilience is to adopt the characteristics of a high reliability organization (HRO).

HROs are commonly found throughout the military. Some examples include aircraft carrier flight decks, nuclear plants, and critical care settings in hospitals. A commonality among these HROs is how they deal with managing risk and crisis situations. How the organization deals with failure, learns from these past experiences, and fosters an environment to avoid errors are what distinguishes a successful organization from an unsuccessful one. These HROs engage in organizational activities that build interdependence among the different departments, which enhances performance and reliability. The building of interdependence creates a mutual dependence among one another and sharing of information (Roberts, 1990, pp. 161–171).

Resilience, at both the individual and organizational levels of analysis, is shaped by team composition and individual relationships. The organization's ability to foster a high level of resilience depends upon its capability to deal with adverse situations and crises. Resilience requires flexibility, social support, a learning orientation, and effective leadership practices (Lopes, 2010). By understanding how the organization restores its efficacy through the management of resources and group interdependence allows the organization to develop an environment in which an HRO can successfully function (Cameron & Quinn, 2006).

B. PURPOSE

While the concept of resilience has become more critical in recent times, empirical research on resilience within military organizations is only beginning to emerge. Boin and van Eeten (2013) pointed out that most often the literature on resilience is normative in nature; that is, it focuses on desirable characteristics necessary to bounce back from setbacks. Moreover, expository analysis of resilience emphasizes individual ability to rely on past experiences to navigate temporary setbacks in order to surface from the crisis with new skills and improved attributes. But too often it is not clear how these skills and improved attributes can be generated within an organization to aid in developing resilience. In a like manner, there is limited empirical evidence that demonstrates how resilience is actually achieved. Boin and van Eeten (2013) argued that it could possibly be the result of either a systematic process or the outcome of improvisation and pure luck (p. 430).

This primary goal of this project is to examine specific resilience factors that contribute to an organization's overall reliability. This project explores how individual attitudes, social support systems, and interdependent groups create resilience within a high reliability organization. Articulated are key resilience factors that have a significant impact on an organization's resilience and commitment to reliability. This project includes a multivariate linear regression model analyzing factors affecting resilience across the demographics of the service members.

C.   SCOPE AND METHODOLOGY

The scope of the thesis includes a sample population of service members who are assigned to a U.S. Navy vessel during a planned incremental availability period in the year 2015. This environment, in which the ship is operating, is uncommon and presents many new challenges that are unfamiliar to most crewmembers. The sample population consists of both officer and enlisted crew members who are assigned to a randomly chosen duty section aboard the ship. Two separate duty sections were independently sampled in March and October of 2015 at two different points in time. Due to the fluctuation of manning onboard the ship and the ship's maintenance schedule, the individuals sampled at each observation point are not the same. This study analyzes the resilience factors and compares the observations between the two sampling points in an attempt to identify key resilience factors within this high reliability organization.

D.   BENEFITS OF RESEARCH

Organizational reliability is a function of those who rely upon others and those who are relied upon. The relationships that exist between those individuals and how they communicate cooperatively without hesitation or fear lead to an increase in organizational resilience (Busby & Iszatt-White, 2014, p. 79). As a result of this project, military leaders will have a better understanding of individual resilience and group resilience and methods to improve factors that contribute to the organization's overall resilience and thus its reliability. High reliability and resilience are closely related aspects. An understanding of the factors that contribute to resilience enable leaders of high reliability organizations to create systems and structures that foster positive relations throughout the organization. This will in turn create a culture that facilitates a higher probability of organizational success and nurture future talent for the military that will be prepared for adversity.

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II.   LITERATURE REVIEW

A.   OVERVIEW

Ho, Teo, Bentley, Verreyne, and Galvin (2014) emphasized that a major criticism of the organizational resilience literature is its lack of exactness on its definition of resilience and its impact on human resource management. They stated: "One of the reasons for this is the lack of agreement on the various definitions of resilience" (Ho et al., 2014, p. 9). There are numerous aspects on how resilience can be observed and how each component relates to one another. This study reviews factors that affect organizational resilience and the implications that it has on the human relations and the organization's ability to be highly reliable. These factors include the interrelating elements of resilience, leadership and teamwork, and how an organization deals with a crisis or failure.

In this chapter, I review the role of resilience with regard to the military environment and the resources that aid in building resilience within an HRO. First, I offer a theoretical overview of resilience and its definitions. Second, I look closely at three areas of management and leadership that play a role in resilience within high reliability systems: organizational effectiveness, relational coordination, and supportive relationships. And finally, I describe the characteristics of an HRO and the role resilience plays within this organizational concept.

B.   RESILIENCE

Typically, as stress and adversity increases, leaders or decision makers narrow their options to eliminate the risk of errors (Sutcliffe & Vogus, 2003, p. 94). This cognitive narrowing is even more prevalent in military environments due to the mechanical hierarchy and demanding levels of responsibility. A tightening of control leads to an unbending and repeated response that may or may not be always correct (Sutcliffe & Vogus, 2003, p. 98). Also with this style of organizational structure and commitment, useful information, which could lead to more successful outcomes or improvements, often fails to make its way to upper-level management. Edmondson

(2008) pointed out that when people are repeatedly instructed to focus on speed, efficiency, and results, those individuals are less likely to interrupt their managers' time with anything other than practical productive information (p. 3). This unwillingness to share information leads to lost opportunities for development and growth.

1. Defining Resilience

Resilience refers to the ability of an individual or organization to bounce back from adversity stronger and with betters skills and capabilities. Resilience arises from an adaptive process while using internal and external resources to successfully overcome obstacles (Sutcliffe & Vogus, 2003, p. 96). Resilience also develops from daily interactions and activities "that promote competence, restores efficacy, and encourages growth" over the course of one's lifetime (Sutcliffe & Vogus, 2003, p. 95). This characteristic or ability develops over time from repeated exposure and positive adjustment to an ever-changing environment. In contrast, the opposite occurs when an individual or organization negatively focuses on their failures or a decline in performance. A preoccupation with problems and failures is useful while building an HRO. However, a negative focus does not support a high reliability environment. Understanding an organization's resilience will provide insight into how likely an organization will be able to achieve desirable outcomes in the face of adversity and adapt to an ever-changing environment (Sutcliffe & Vogus, 2003, p. 194).

Sutcliffe and Vogus (2003) described resilience as the "maintenance of positive adjustment under challenging conditions" (p. 95). Such maintenance allows one to continually adapt to and overcome adversity. Individual resilience, or the ability of an individual person to bounce back positively from an adverse event, has been argued to be either an instinctive personality trait or a byproduct of the processes learned through one's life or work experiences. Consistent with Sutcliffe and Vogus, I argue that resilience results from the presence of adequate resources, abundance of diverse experiences and situations, and the subsequent inferences gained during the process of overcoming adversity. Having the adequate resources and positively adjusting to past adverse conditions allows one to continually evolve and prepare for future obstacles.

Sutcliffe and Vogus (2003) warned if resilience is represented as a personal trait this may imply that some individuals may not have the innate ability to overcome adversity, and possibly lead to an avoidance for further develop the individual (p. 96).

Resilience emerges as a consequence of the individual's social interactions and resources present in his or her environment. Sutcliffe & Vogus (2003) noted how early experiences can either positively or negatively affect later experiences. The ability for an individual or organization to respond to new challenges depends upon their attitude, expectations, and prior experience. Positively adjusting to past adversity strengthens capability to respond to future challenges (p. 97). Tusaie & Dyer (2004) acknowledged that there are many forms of stress and adversity in our work environment. Those who are able to overcome stress and adversity and perform above the average have valuable knowledge to share (p. 4). Furthermore, an organization's ability to efficiently access this information and share it with others builds their worker's available resources. The process of becoming more resourceful for future circumstances generates positive resilience. Understanding the various forms of resilience that exist enables an organization to build positive resilience and, in turn, increase the organization's reliability specifically in environments requiring high reliability. Below, I discuss individual, group, and organizational resilience and identify the specific resilience qualities that exist within a military setting.

2. Individual Resilience

Sutcliffe and Vogus (2003) described two building blocks—adequate resources and an active mastery motivation system—that support individual resilience. First, individuals that have an adequate amount of resources are more likely to fully develop their skills and abilities and, as a result, develop resilience. The second building block, the mobilization of the individual's motivation system, occurs when the individual has had experiences that build confidence that allow a person to excel in future situations. Sutcliffe and Vogus (2003) termed these *mastery experiences.* When the individual is given the opportunity to exercise behaviors such as judgment, discretion, and imagination, this further contributes to the individual's development and ability to learn

and recover from setbacks. This effect is also multiplied when they observe mentors who exercise similar behaviors (p. 100). As the individual learns to respond to unfamiliar and adverse experiences, a sense of competence begins to take hold and resilience begins to emerge. This may not guarantee success in all endeavors but it improves the individual's capacity for recovery or maintains the individual's ability to positively adjust vice withdrawing and responding undesirably to an event (Sutcliffe & Vogus, 2003, p. 101).

Many of early studies of resilience focused on the individual's ability to respond and thrive when adverse conditions arise. Tusaie and Dyer (2004) recognized that there are many factors or characteristics that either hinder or aid this process (p. 4). These factors can be subdivided into two general categories: interpersonal and environmental, which will be measured in this project. The interpersonal factors include cognitive traits, which may be individually subjective, and include optimism, creativity, humor, an appreciation for the uniqueness of oneself, and specific abilities to develop coping strategies and social skills, all of which contribute to resilience (Tusaie & Dyer, 2004, p. 4).

3.   Group Resilience

Cacioppo, Reis, and Zautra (2011) recognized that resilience is a multi-level construct that comprises the factors and characteristics of the individuals and also the group's ability to sustain positive social relationships. These positive relationships aid in dealing with environmental and individual stressors and the avoidance of social isolation (p. 43). The group's behavior patterns are associated with individual resilience traits that make up the group. Individuals within a group, who have a high level of resilience, may regard setbacks in the face of adversity as a natural part of core competence building and not react negatively to failure. Adding to this high level of resilience, groups that are goal oriented to learning new abilities and acquiring new skills are more likely to positively adjust to adversity and sustain a high level of reliability over the long term (Sutcliffe & Vogus, 2003, p. 101). Similar to individual resilience resources, group resilience arises through the development of personal, relational, and collective social capital, which further strengthens the existing social structure (Cacioppo, Reis, & Zautra, 2011, p. 44).

Resilience at the group level is not simply the sum of the individual members' resilience. Group resilience refers to a group dynamic that links learning from challenges and with growth to increase a group's efficacy and social resources (or social capital) for future challenges. Social capital is comprised of good will, mutual respect, and group camaraderie (Aldrich & Meyer, 2015). An individual's inclusion and participation within social groups has positive effects for the individual, due to the increase in available resources (p. 3). Aldrich and Meyer (2015) described three elements of social capital— bonding, bridging, and linking. Each varies in strength and structure within the social network and thus is utilized differently by the group members depending on individual background. Bonding capital refers to close personal relationships with individuals, such as friends or family, which are consequently often the strongest. Bridging capital includes acquaintances within loosely associated social groups, such as school affiliation or one's branch or rating in the military. These relationships often display demographic diversity, ethnic, and cultural resources. Linking capital joins those individuals across the organizations hierarchy and is dependent on an organization's cultural standards and formalization of institutionalized power (pp. 5–6). Bonding social capital is the most common and easily accessed resource due to the intrinsic deep bonds. However, the group's capacity to blend all three types of social capital will only add to the core competencies of the group and its ability to deal with adversity.

There are multiple ways to skillfully take advantage of these different forms of social capital and build group competence. Sutcliffe and Vogus (2003) suggested that one mechanism of developing the group's core competency is through the sharing of accumulated knowledge. They reported: "[The] research shows that accumulated prior knowledge is necessary for new knowledge to be assimilated and used" (p. 101). A second mechanism is to vary the group's makeup (Sutcliffe & Vogus, 2003, p. 102). Within the military this mechanism is readily used because of the diverse composition of the individuals. A third mechanism is vary the different levels of experience within the group: "Teams composed of at least some individuals with broad expertise may be better able to grasp variations in their environments and to see changes that need to be made and may also be better at coping—especially when they have the capability to act"

(Sutcliffe & Vogus, 2003, p. 102). This variation in team diversity is sometimes a difficult task to accomplish because of the desire to avoid errors in face of adversity.

Leaders often narrow their options and place the most highly skilled individuals on task. This leads to a further narrowing of the individual's skillset, and consequently they become specialists. Committing to diversifying the group's composition leads to a varied set of experiences and better prepares each individual for future unanticipated events. A diverse composition of individuals and sharing of experiences fosters "T" shaped individuals (Bernstein, Francesca, & Bradley, 2014, p. 7). A "T" shaped individual is one that possesses both broad and narrow skills and abilities. The top of "T" represents the individual's diverse experience and knowledge; and the vertical leg of the "T" represents the individual's specialized knowledge, which is more in depth for a particular field (Bernstein et al., 2014, p. 7).

A diverse group with ample social capital strengthens an organization's capacity to bounce back from adversity and increase its reliability. Sutcliffe and Vogus (2003) implied that the group's shared belief in their capabilities, called collective efficacy, supports group resilience. (p. 102). This factor is highly dependent on "whether its members interact with one another in mutually facilitatory or undermining way" (Sutcliffe & Vogus, 2003, p. 103). If a group's collective efficacy falters it will have a detrimental impact on the organization's resilience and will impact the organization's reliability.

4.   Organizational Resilience

Organizational resilience bears some similarity with individual and group resilience previously discussed. Resilience at the organizational level is the ability to bounce back and preserve organizational functionality "despite the presence of adversity (both internal adversity—such as rapid change, lousy leadership, performance and production pressures—and external adversity—such as increasing competition and demands from stakeholders)." (Sutcliffe & Vogus, 2003, p. 96). Organizational resilience is created through the enhancement of skills and abilities that efficiently utilize and combine resources as well as encourage a culture of mindfulness. Mindfulness improves

the organization's ability to anticipate and appropriately respond to adversity before the situations deteriorates to a point when there are no more potential solutions (Sutcliffe & Vogus, 2003, p. 104). Mindfulness also further reinforces the organizational culture and beliefs that allow the individuals to continually refine and categorize existing beliefs in order to make sense of new unexpected experiences (Weick & Sutcliffe, 2001, p.42).

As discussed with social resilience, organizational resilience is dependent upon its ability to restore efficacy after an adverse event. Efficacy assists in building resilience by strengthening social capital, opening the channels of communication (Sutcliffe & Vogus, 2003, p. 106), and taps into to those "T" shaped individuals who have the greatest expertise with decision-making and problem solving. One mechanism to restore efficacy (besides establishing cultural norms and practices) is to allow for conceptual slack. Sutcliffe and Vogus (2003) referred to conceptual slack as the willingness to question an organization's process or capability through mutually facilitatory interactions in order to add to the organization's body of knowledge (p. 105). Enabling individuals to question what is happening within the organization and freely exchange information occurs in a psychologically safe environment.

Edmondson (2008) suggested that in psychologically safe environments individuals are more willing to discuss ideas and concerns with their managers and co-workers. And, in the process of doing so, the individual gains knowledge and builds social capital (p. 5). Edmondson (2008) also argued that managers might be inclined to believe a psychological safe environment lowers the ability to hold individuals accountable for his or her actions. She also acknowledged that if employees have strong social capital, such as bonding, bridging, and linking (Aldrich & Meyer, 2015), this may weaken the leadership's authority. Despite this point, a psychological safety mindset opens the organization to the possibility of debate for improved performance (Edmondson, 2008, p. 6). A psychological safe culture is separate from accountability and goal setting. Edmondson (2008) noted that setting ambitious goals while acknowledging there may be limitations to current processes encourages growth instead of continuing with the existing state of affairs and creating a possible organizational decline (p. 7).

5.   Military Resilience

In military organizations there are additional stressors that compound an organization's ability to preserve its core functionalities. Bartone (2006) listed issues such as isolation, ambiguity, powerlessness, boredom, and danger (p. 134). With continued downsizing of today's modern military and increased op tempo these challenges are intensified. As a result, those organizations with initially low levels of resilience will likely be at greater risk. Bartone (2006) argued that military organizations must acknowledge workload as an additional stressor, which includes the stress leading up to, during, and following deployment. These stressors are detailed in Table 1. These different dimensions overlap and continually influence each other (p. 134). Bartone (2006) recognized that unit cohesion and the development of social capital aid in building a military organization's resilience in the face of adversity (p. 136).

Table 1.   Primary Stressor Dimensions in Modern Military Operations

Stressor	Characteristics
1. Isolation	Remote location Foreign culture and language Distant from family and friends Unreliable communication tools Newly configured units, do not know your coworkers
2. Ambiguity	Unclear mission or changing mission Unclear rules of engagement Unclear command or leadership structure Role confusion (what is my job?) Unclear norms or standards of behavior (what is acceptable here and what is not?)
3. Powerlessness	Movement restricitons Rules of engagement constraints on response options Policies prevent intervening, providing help Forced seperation from local culture, people, event, and places Unreponsive supply chain—trouble getting needed supplies and repair parts Differing standards of pay, movement, behavior, etc., for different units in area Indeterminate deployment length—do not know when we are going home Do not know or cannot influence what is happening with family back home
4. Boredom (alienation)	Long periods of repetitive work activities without variety Lack of work that can be construed as meaningful or important Overall mission or purpose not understood as worthwhile or important Few options for play and entertainment

5. Danger (threat)	Real risk of serious injury or death, from:
	    Enemy fire, bullets, mortars, mines, explosives, etc.
	    Accidents, including "fiendly fire"
	    Disease, infection, toxins in the environment
	    Chemical, biological, or nuclear materials used as weapons

6. Workload	High frequency, duration, and pace of deployments Long work hours and/or days during the deployment Long work hours and/or days in periods before and after deployments

Source: Bartone, P. T. (2006). Resilience under military operational stress: Can leaders influence hardiness? *Military Psychology*, *18*, S131-S148. Retrieved from http://dx.doi.org/10.1207/s15327876mp1803s_10

McGarry, Walklate, and Mythen (2015) stated that the development of social capital and resilience in military setting relies upon three factors—"individual traits, interpersonal relationships, and as a skill to be learned" (p. 354). With ethnic and socio-economic diversity inherently embedded in military organizations, the importance of developing ways to promote unit cohesion aids in dealing with the numerous psychological stressors listed in Table 1. McGarry et al. (2015) recommended analyzing military organizational resilience by expanding the levels of individual, group, and organizational resilience to include that of the community and the relationships established with the military organization (p. 356). The now larger social/community

resilience is described as "the collective ability of a neighborhood or geographic area to deal with stressors and efficiently resume the rhythms of daily life through cooperation following shocks" (Aldrich & Meyer, 2015, p. 2). Since military organizations often incorporate a large area or community, social capital is also developed outside the organization to assist with the stressors of military workload and deployments. This enables military organizations to draw on the support of neighboring commands in order to remain effective in the face of adversity (McGarry et al., 2015, p. 358).

Two aspects that help promote social capital within the military organization include social climate and social embeddedness (Jex, Kain, & Park, 2013, p. 70). These are important to consider while building social capital—bonding, bridging, and linking (Aldrich & Meyer, 2015)—but, as discussed, the unique diversity that lies within the military may require additional effort to overcome. Social climate within a military context would be one where soldiers are comfortable assisting one another in developing new skills and abilities (Jex et al., 2013, p. 70). Jex, Kain, and Park (2013) claimed that this type of climate would be one in which soldiers would do everything for each other as they would want for themselves. Social embeddedness is regarded by the depth of the influence people have with one another in their social network. "In the military, soldiers who have stronger relationships with other members in their units are more likely to receive social support" (Jex et al., 2013, p. 70). In the military setting, the existence of the three categories of social capital and the variance that exists among them due to social climate and embeddedness may indicate that social support is one of the key situational elements of a military member's resilience (Jex et al., p. 73). By engaging in activities that build and maintain the military member's resilience, this will allow the organization to achieve a high level of reliability.

C.   LEADERSHIP AND TEAM MANAGEMENT

There is a fine line between mistake avoidance and the ability to recognize blind spots within an organization. Having safety nets in place that create a sense of psychological safety for employees allows an organization to anticipate potential setbacks and in the long run focus on the long term goals of the organization. When leadership and

managers scrutinize small failures and put systems in place to understand their current environment and past experiences, this strengthens the organization's ability to bounce back from unforeseen events (Weick, 2006, p. 61). One way to share information gained during the process of examination in a multi-departmental organization is through relational coordination. Relational coordination within an organization permits the achievement of a common goal or task (Gittell, 2002, p. 1410) such as high reliability. Bartone (2006) noted that military units typically exhibit high levels of relational coordination. This ability is demonstrated during the conducting of large scale maneuvers (p. 138). In this section, I will discuss how leadership and team management impacts organizational effectiveness and tools such as relational coordination and the development of supportive relationships moderate these effects.

1.   Organizational Effectiveness

An organization's effectiveness is only as reliable as its culture of mindfulness, system to report errors, and time until the next error occurs. Past success for organizations does not guarantee future success. A continuous investment must be made into improving systems, performance standards, and positive workplace practices that are already in place or they are likely to degrade (Weick, 2006, p. 58). If these systems or standards are allowed to degrade the organization's environment, this can negatively impact the organization's resilience when faced with workplace stressors (Gittell, 2008, p. 26). Consequently, this reduces an organization's ability to maintain high levels of reliability during and after an adverse event.

Cameron, Mora, Leutscher, and Calarco found in a 2011 study that there was a statistically significant association between positive practices and workplace climate. They found that organizations "with higher scores on positive practices experienced a better work environment, more effective relationships with management, and greater numbers of employees intending to stay with the firm" (p. 275). Some of the positive practices that help foster individual's relationships and improve organizational effectiveness are mutual respect, support, caring, meaning, inspiration, and forgiveness (Cameron et al., 2011, p. 272). These positive practices can be combined into a term

commonly called social sensitivity. According to Barrett (2012), social sensitivity is one of the three factors that make a group of individuals collectively more intelligent. By understanding how others in the group are thinking and feeling, through the ability to read each other's emotions and act in an empathetic way, was shown to add to the intellectual capacity of the group (p. 129). Social sensitivity is a key component of psychological safety and enables individuals to share information freely without fear of rejection.

The need for sharing information openly is vital if the organization wishes to improve its effectiveness and reducing its risk of failure, therefore, enhancing the organization's reliability—particularly when faced with challenges. Boin and van Eeten (2013) described two stages of a crisis. The first being the manifestation of the crisis and the second is the reestablishment of normalcy. The second stage ideally should influence the group's ability to emerge stronger from the crisis, which implies that learning has occurred (p. 431). As discussed earlier, when information flows freely within the group, this increases their intellectual capacity, which prepares them for future situations. Carmeli and Gittell, (2009) noted that despite an increasing effort, organizations are not learning enough from their mistakes. This is mainly due to a lack of effort put toward developing effective programs to learn from previous errors. This raises the question of what barriers are there to learning and how can an organization develop a strategy to overcome them (p. 711). Ho et al. (2014) asserted that the organization's management of its human resources is key to the guidance of behaviors during a crisis. While military organizations play a very little part in the selection process of their individuals, human resource departments can influence the organization's ability to deal with adversity and establish desired employee behaviors. These tasks include leadership development, workplace environment training, and the desired blend of personnel (skill sets and experience) (p. 12).

2.   Relational Coordination

Typically high-efficiency, low-risk organizations are often managed by single entities rather than multifaceted layers and departmentalized structures. The difference

between these types of organizations and HROs is that their processes are built to allow for minor errors and setbacks (Weick & Roberts, 1993, p. 376). Weick and Roberts, (1993) suggested that these differences are attributed to these high-efficiency, low-risk organizations having simpler minds than HROs (p. 376). This is why it is important for high-risk, departmentalized organizations to develop a sense of collective intelligence and increase task-related interdependence to act more like high-reliability systems (Weick & Roberts, 1993, p. 376). Tusaie and Dyer (2004) added that "the importance of interdisciplinary teams and interdisciplinary training as part of professional education can only add to the understanding and application of the construct of resilience" (p. 7).

Gittell (2002) labeled four concepts that assist organizations in developing interdisciplinary relationships. These are routines, boundary spanners, team meetings, and relational coordination. Routines are developed through lessons learned and are continually improved upon from shared knowledge. Routines and procedures capture best practices. Boundary spanners are those whose main responsibility is to oversee a specific process and interact with other specialists outside their own area of expertise or organizational position. In most organizations boundary spanners are commonly known as liaisons (p. 1409). An example of a boundary spanner is a primary care nurse in large medical facility. These nurses are responsible for coordinating a patient's daily activities and procedures across multiple departments and specialties. Boundary spanners advance the performance of those interdependent departments by ensuring information is shared to promote the group's collective intelligence. Team meetings also improve a group's collective intelligence by allowing the individuals to share information with one another and facilitate the development of social capital (Gittell, 2002, pp. 1409–1410).

Relational coordination is the coordination of interdependent groups within the organization to achieve a common goal or task. In a relational coordination construct "coordination is carried out through relationships of shared goals, shared knowledge, and mutual respect" (Gittell, 2002, p. 1410). These strong relationships allow individuals to more effectively function in a multi-departmental/multidisciplinary organization. The ongoing development of relational work systems function to support the organization through uncertainty and difficulty. Relationships created by boundary spanners and

relational coordination structures serve as an important function for not only helping individuals return to baseline after an adverse event, but also allow the organization to open new pathways of communication to improve levels of resilience (Feeney & Collins, 2015, p. 4).

Constructing a relational work system permits an organization to support and develop the social networks through which social resilience is built. These work practices are similar to many of the high performance work systems found in organizational behavior literature. In a like manner, these relational work practices are designed specifically to generate cross-departmental relationships among the workers and promote social capital (Gittell, 2008, p. 30). The coordination and "management of interdependencies among tasks is believed to be critical for organizational performance" (Gittell, 2002, p. 1408). One of the strategies used in the medical community is to incorporate TeamSTEPPS (Team Strategies and Tools to Enhance Performance and Patient Safety). This system, illustrated in Figure 1, is focuses on improving communication channels and coordinating activities across the medical specialties and departments. TeamSTEPPS allows boundary spanners to come together during a team meeting and share information in a psychologically safe environment. It also ensures accuracy by utilizing collective intelligence, and provides feedback in a mutually respectful manner to achieve relational coordination.

Figure 1.   TeamSTEPPS: Team Competency Outcomes
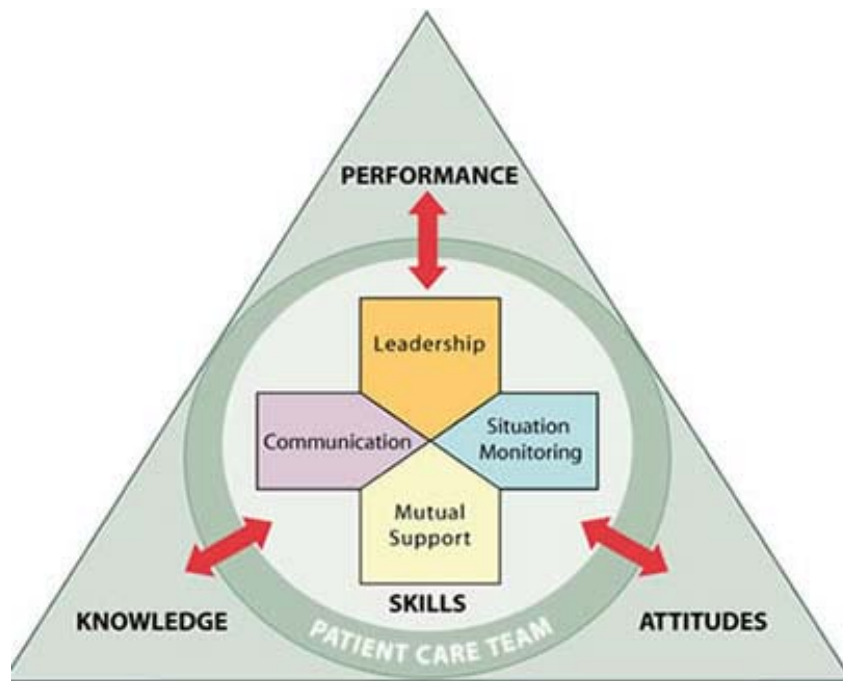
3.   Supportive Relationships

Feeney and Collins (2015) observed that most organizational behavior literature supported their view that individuals who are more socially integrated and have supportive relationships with others have an enhanced state of well-being (p. 1). Through perceived social support and relationships a foundation of social capital is produced. This allows individuals to thrive in environments of adversity and provide "opportunities for growth in the absence of adversity" preparing them for the next unforeseen event (Feeney & Collins, 2015, p. 2). Group resilience is dependent upon the group's collective situational awareness and their connections with others. These relationships as well as relational work practices lead to positive, resilient outcomes (Cacioppo et al., 2011, p. 50).

Similar to Barrett's (2012) concept of collective intelligence, collective efficacy influences a group's performance and the ability to deal with external threats. Collective efficacy reduces the negative effects of workload stressors and increases the probability

of achieving an organization's common goal or task (Gittell, 2008, p. 27). Collective efficacy resulting from added social cohesion and social support provides "a kind of psychic support such that the stress is shared among their members and is therefore less intensely experienced by any one of them" (Gittell, 2008, p. 28).

With resilience being the ability to deal with adversity and bounce back stronger than before, self-efficacy supports individual resilience and this ability to bounce back. With group resilience, collective efficacy is founded through supportive relationships (Gittell, 2008, p. 29). Individuals learn to thrive when collective efficacy is present. Also, as the collective intelligence of the group grows, individual and groups achieve a higher level of resilience rather than returning to baseline (Feeney & Collins, 2015, p. 3). Even when adversity is not present, the individual will be able effectively contribute to the organization when opportunities arise and will experience "personal growth through work, play, socializing, learning, discovery, creating, pursuing hobbies, and making meaningful contribution to community and society" (Feeney & Collins, 2015, p. 4).

D.   HIGH RELIABILITY ORGANIZATIONS

Boin and van Eeten (2013) pointed out that high reliability theory involves a special class of organizations. These organizations are responsible for the management of highly technical and hazardous systems. Failure within these organizations could result in severe damage and the loss of lives (p. 432). The goal of HROs is to produce an environment of high reliability during stressful conditions with minimal to no adverse events (Weick, 2006, p. 55). An HRO is able to recognize and prevent a series of potentially detrimental events through organizational processes and management.

Busby and Iszatt-White (2014) determined that an organization's reliability is determined by two key dynamics. These are the reliance on an individual or group, based upon a specific relationship for that situation; and whether or not there is a culture of mutually reliability present across the organization (p. 77). This dynamic determines how reliable an organization can be and the required presence of reliability when performing dangerous tasks such as operating a nuclear plant or launching and landing aircraft on a carrier (Busby & Iszatt-White, 2014, p. 79).

1. Characteristics of HROs

HROs are highly technical and have a clear awareness of the procedures and practices that prevent the organization from experiencing catastrophic failure. They also have clearly established roles and responsibilities, which cultivate a team-based approach to problem-solving (Boin & van Eeten, 2013, p. 433). HROs continually reassess routines and remain preoccupied with failure. During this process, HROs "identify mistakes they don't want to make. Then they identify practices that prevent those mistakes, then the principles that generate those practices, and finally values that generate those principles" (Weick, 2006, pp. 63–64).

Boin and Schulman, (2008) emphasized that an HRO with a team-based approach to problem-solving encourages and reinforces the values of respect, attention to detail, and mutual responsibility for safety throughout the organization (p. 1052). Past studies on high reliability organizations have concentrated on the features of the organizations and their individuals. Only recently studies have begun to assess the importance of teamwork and relational coordination in an HRO. Most of these studies have taken place in medical organizations in an attempt to avoid malpractice lawsuits, improve efficiency, and reduce patient's length of stay (Wesnser, 2015, p. 3).

2. Resilience and HROs

One of the values of high reliability discussed by Weick and Sutcliffe (2001) is a commitment to resilience. The commitment is achieved through an intense knowledge of the worker's attitudes, experience, and skills within the organization (p. 14). In order to understand the worker's attitudes and perceived experiences, an HRO must be able to create a climate of psychological safety. Psychological safety refers to one's comfort level with another's response and the belief they would mutually accepted when they ask a question or give feedback on a subject (Carmeli & Gittell, 2009, p. 712). Often times, when an individual fails at a task, the individual fears the repercussions of speaking up because the underlying cause may fall directly upon them. While this may be true, more often than not the failure is due to a flaw in the process. Edmondson, (1999) emphasized for a group to develop a sense of psychological safety "it must characterize the team

rather than individual members of the team and team members must hold similar perceptions of it" (p. 354). Psychological safety is developed through the belief they will not be rejected through their past experiences with other team members. When other team members share their own and others' mistakes, the team produces a sense of appreciation and interest in the others experiences (Edmondson, 1999, p. 354).

3.   Resilience and Military HROs

Weick (2006) defined reliability as the "lack of unwanted, unanticipated, and unexplainable variance in performance" (p. 57). The skill sets of reliability and crisis management place diverse demands upon a military organization. Reliability is a continually exhibited trait that requires specific structures and processes to enable it. Crisis management requires repetition of training for known possible adverse events and a mindset for the unforeseen. For an organization to become resilient, it must construct a flexible environment that freely navigates between trial and error learning and crisis anticipation (Boin & van Eeten, 2013, p. 443).

Due to the military's rigid structure and mechanistic hierarchy, it is often difficult to change an organization's concept of reliability and resilience. Senge (2006) stated that this disease of the hierarchy can be overcome by the use of vision, values, and mental models (p. 171). "Mental models are the deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action" (Senge, 2006, p. 8). Senge (2006) acknowledges that psychological safety and openness can transform the group's decision-making process. The group's ability to openly discuss their different opinions and views permits the team to avoid defensive routines. These defensive routines limit the team's ability to examine their current mental models and hinder potential learning (p.172). This further echoes the importance of psychological safety within the group, which can only enhance team learning and the group's resilience. C. Lengnick-Hall, Beck, and M. Lengnick-Hall (2011) emphasized that routines such as continuous dialogue assist in developing trust, avoiding defensive routines, and building social capital (p. 252).

E. HIGH RELIABILITY MODEL AND HYPOTHESES

1. High Reliability Model

From the literature review, the connections between resilience and high reliability are deeply intertwined. The three factors in Figure 2—psychological safety, cohesion, and learning goal orientation—correlate highly with HRO culture literature and will be the focus of this project's regression analysis. The additional factors of procedural justice, identification, and leadership support this culture through the perception of fairness, clearly defined roles and relationships, and mutual support. Each of these factors are also strengthened through relational coordination practices, which improve and open new channels of communication, allowing the organization to achieve higher levels of resilience and, therefore, higher levels of reliability.

Figure 2.   High Reliability Model
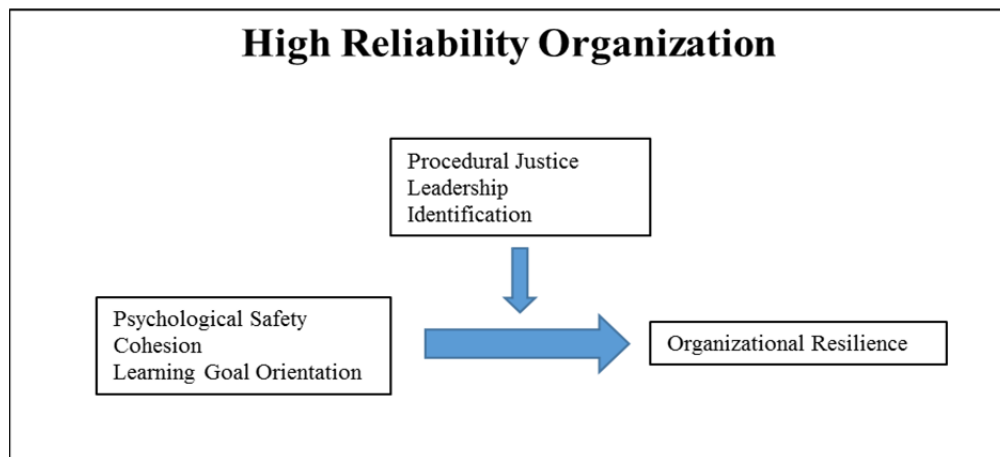
The high reliability factors of psychological safety, cohesion, and learning goal orientation—supported by procedural justice, identification, and leadership—contribute to the organization's level of resilience, which ultimately influences the organization's level of reliability.

2. Hypotheses

The focus of this project is to determine if individuals in the organization studied have common perceptions of mutual support, positive social relationships, and a team mindset. Also, to ensure communication flows freely across all channels, maintaining a culture of high reliability, the supporting factors of procedural justice, leadership, and

identification are needed throughout the organization. A common theme discussed throughout the resilience and high reliability literature review was the presence of psychological safety. Therefore, I hypothesize that:

Hypothesis 1: Psychological safety is a significant predictor of organizational resilience.

Hypothesis 2: Psychological safety is perceived equally across all the ranks.

Hypothesis 3: The effect of the moderating factors on psychological safety is equal across the ranks.

F.   CHAPTER SUMMARY

Resilience is the ability to bounce back stronger than before from adversity or challenges. Resilience is strengthened by a positive mindset and diverse learning experiences to prepare for future events. Through psychological safety, mutual respect, and an adequate availability of social capital, individuals are able to effectively prepare and cope with an every changing environment. Resilience and social capital is also strengthened through interdisciplinary relationships. This is why it is important for high-risk organizations to develop a sense of collective efficacy and increase task-related interdependence through relational coordination. This structure enables highly technical and high-risk organizations to achieve and maintain high levels of reliability by repeatedly demonstrating the ability to bounce back from crisis situations (Wesnser, 2015, p. 4).

Military organizations often operate in a stressful, hostile environment. These additional stressors pose additional challenges to the organization's ability to effectively manage the organization's functionality and resilience. Mutual respect and psychological safety allow the individuals to experience positive practices and a supportive workplace environment. This climate of supportive relationships aids in the flow of communication and discovery of potential pitfalls for an organization, which allows the organization to achieve higher levels of reliability. As an organization seeks to acquire the qualities of an HRO, the factors that contribute to an organization's resilience should be taken into consideration. This project will attempt to determine which factors are significant indicators of organization resilience and if there are any moderating factors across the rank demographics.

III. DATA AND METHODOLOGY

A. OVERVIEW

In order to measure the organization's resilience, a survey was administered to the crew members of a U.S. Naval vessel, while in a shipyard during an incremental availability period. The data from this survey was then organized and evaluated to determine potential areas of weakness with regards to the organization's levels of resilience and reliability. The data was then further analyzed by a multivariate linear regression model in order to determine how the individual demographics were affected by the high reliability and resilience factors. These factors of interest focused on the various elements that aid in supporting an organization's goal of high reliability and build social capital for improved resilience. Some of the individual elements of resilience that are intrinsically related to social capital are varying levels of trustworthiness, openness, group identity, cohesiveness, respect for others, and perceiving others empathically (Cacioppo et al., 2011, p. 44). By placing an emphasis on the individuals within the organization and their capacity to work with others, the group's capacity to strengthen their resilience through social capital will be determined.

B. DATA

The study was conducted by utilizing the data collected from surveys administered to a naval ship in March 2015 and October 2015. Data was gathered from a portion of the ship's duty section during each visit. The participants in each duty section consisted of approximately 100 individuals and were heterogeneous in terms of gender, ethnicity, and educational level.

1. Data Sample

Sample 1 (n = 103) was collected for the current ongoing resilience study during the March 2015 visit. The sampled demographics consist of 80 men (77.7%) and the mean age was 25.3 years (SD = 5.0). There were 3 officers and 100 enlisted in the

sample, average active duty time in years was 5.2, and the individuals averaged 20 months at the command. There was no departmental focus in this sample group.

Sample 2 was collected in October 2015 (n = 133). The sample demographics included 72.5% male and the mean age was 23.1 years (SD = 5.5). There was 1 officer and 129 enlisted in the sample. The average active duty time in years was 4.89 and the individuals averaged 23.1 months at the command. There was a departmental focus on the Operations department in the October 2015 sample group. Table 2 shows the demographic information across the two samples.

Table 2.   Demographic Information

Variable	Mar 2015	Oct 2015
Age (Years)	25.3	26
Gender		
Male	80	95
Female	23	36
Education		
12-14 years	84	97
14 years	9	20
16 years or more	10	15
Ethnicity		
White	62	75
Black	11	28
Hispanic	14	10
Asian	6	12
Other	9	7
Rank		
Officer	3	1
Enlisted	100	129
Department		
Operations	11	33
Other	91	100
Active Duty (Years)	5.21	4.89
Time at Command (Months)	20.40	23.11
Organizational Resilience Score	4.57 (SD=1.23)	4.50 (SD=1.27)

2.   Data Collection and Survey

A 169-item survey was employed measuring different aspects of high reliability and organizational resilience. The survey assesses the presence of positive functioning and the ability to respond effectively to adversity through several validated scales for the

areas of: psychological safety, cohesion, procedural justice, identification, learning goal orientation, leadership, and organizational resilience.

Psychological Safety. The first measure was scored as a 7-item scale in which the respondents rated items on a scale from 1 (strongly disagree) to 7 (strongly agree). A score of 1–3 signals the individual disagreed with the statement, 4 was a neutral statement, and a score of 5–7 indicated the individual agreed with the statement. Edmondson (1999) described psychological safety as a mutually shared belief that allows individuals to feel safe and share information, which allows risk taking and further build the group's efficacy. Without psychological safety, a group's commitment to learning is greatly inhibited because there will be a resistance to admit errors and seek out problem-solving activities (p. 352). When individuals are in groups who feel psychologically safe, they will engage in learning behaviors that further develop the collective mind and enhance an HRO. Edmondson (1999) also noted that psychological safety is different from cohesiveness because it allows the individual to challenge the norm and propose alternate solutions to a problem, whereas cohesiveness has a tendency to reduce the willingness to disagree (p. 354).

Cohesion. The second measure consisted of potential responses to the proposed statements ranging from 1–7 (strongly disagree-strongly agree). Cohesion within a group of individuals or team is important within an organization for improved performance and organizational effectiveness. Cohesion as defined by Barrick, Bradley, Kristof-Brown, and Colbert (2007) is the "affective, psychological state that reflects the shared commitment, attraction, and team pride that emerges from the experiences and interactions among team members" (p. 545). The importance of communication and mutual respect in cohesion greatly impacts the group's ability to perform in times of adversity. The connection between group cohesion and performance can be moderated by group size and group interdependence (Beal, Cohen, Burke, & McLendon, 2003, p. 989). For an HRO, strengthening the group's cohesion through relational coordination practices enhances the organization's task interdependence. The items in the survey attempt to identify patterns of cohesion and performance with regards to task interdependence.

Procedural Justice. The third measure surveyed perceptions of fairness and equality experienced by those within the organization. This aids in building mutual respect and organizational commitment, which is essential when fostering an environment for teamwork and relational coordination. The survey scale for procedural justice ranged from 1–7, in which the individual determined if the division's procedures used during the decision making process were fair by indicating 1 (to a very small extent) of the time and 7 (to a very large extent) to the proposed statements. When procedural rules are just and unbiased, individuals develop a sense of organizational value and willingness to comply with the decisions of the collective group that is also facilitated by an environment with psychological safety and unit cohesion (Colquitt, 2001, p. 388).

Identification. This measure consisted of responses to the proposed statements ranging from 1–7 (strongly disagree-strongly agree). The category of identification in this study was further broken-down into four components in order to better understand the numerous roles and relationships experienced in the military environment. These components measured the individual's identification with the Navy, as a sailor, with their division (group), and with their leader. Identification as a sailor and to the Navy instills pride and adds to team cohesion. The individual's identification with their division and leader permits the aligning of goals with the organization's goals because of the desire for consistency within the group (Sluss, Ployhart, Cobb, & Ashforth, 2012, p. 955). Sluss and Ashforth (2007) claimed relational identification is "the extent to which one defines oneself in terms of a given role-relationship" (p. 11). These individual roles and relationships are the basic building blocks of social capital that is needed to react in a timely manner to environmental disturbances. When adverse conditions arise, typical bureaucratic structures and organizational control systems deteriorate and individuals turn to more informal networks, such as those found with bonding, bridging, and linking social capital (Sluss & Ashforth, 2007, p. 10; Aldrich & Meyer, 2015, p 5–6).

Learning Goal Orientation. The fifth measure assessed the individual's orientation to learning as a goal. The scale consisted of potential responses to the proposed statements ranging from 1–7 (strongly disagree-strongly agree). An individual's commitment to learning determines the organization's commitment and capacity for

learning (Senge, 2006, p. 7). The statements proposed in this section attempt to assess the newcomer's enthusiasm for learning and determine if the organizational environment encourages continued growth in this area. By supporting an environment of learning, this opens channels of dialogue and allows teams to collectively establish group intelligence. As Senge (2006) pointed out, teams are the fundamental learning units of modern organizations, not the individuals (p. 10). To expand this point, the skills and abilities that are learned by these teams disseminate to other teams throughout the organization and produces a new standard of learning (Senge, 2006, p. 219). As many of these components of organizational resilience and reliability interrelate, elements such as psychological safety and cohesion reinforce this group's learning behaviors.

Leadership. The sixth measure looked at the individual's perceptions of their leader and the leader's ability to strengthen the group. The scale consisted of potential responses to the proposed statements ranging from 1–7, 1 (never) and 7 (always), in which the individual determined if the statements provided were in agreement with their perception of leader-member relationship. The importance of the leader's actions within the department, or division for military settings, is crucial for developing the group's mindset and assimilating newcomers (Sluss & Thompson, 2012, p. 2). With the military having a higher rate of turnover than most organizations, the attitudes of the newcomer in their early stages can influence their level of resilience throughout the remainder of their tour. Sluss and Thompson (2012) described leaders at the divisional level as socializing agents. Leaders through the development of a high quality relationship assists the individuals—through access to resources, mutual support, and advice—in developing social capital (p. 3). This increase in resources, as a result, will influence the other components of this study's reliability model and the ability to maintain a high level of resilience.

Organization Resilience. The final measure determined the group's level of efficacy and its ability to respond positively to adversity. The scale consisted of potential responses to the proposed statements ranging from 1–7 (strongly disagree-strongly agree). Many of the other factors discussed previously in this section have a direct influence on the group's ability to attain a high level of resilience. For the purposes of

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this project, an in-depth regression analysis was performed in an attempt to determine which of the three main high reliability factors - psychological safety, cohesion, and learning goal orientation - have the strongest impact on the organization's resilience and therefore high reliability.

C.   METHODOLOGY

The components chosen from the survey to measure the relationship between high reliability and resilience, specifically the ability to build and maintain resilience, are: procedural justice, leadership, identification, learning goal orientation, psychological safety, and cohesion. These six factors and how they are perceived across the organization's demographics were used to determine if there was an area of significant deficiency in the organization's ability to maintain resilience and develop social capital with the purpose of bouncing back positively from adversity.

The six factors were first analyzed visually for trends across two measurements and their means, which are described in the Appendix. The first measurement was by rank to determine if all levels of the organization were in agreement. The second measurement was time onboard to determine if newcomers were adequately assimilated into the culture and given the resources to thrive in the absence of adversity over time.

The next step was to run a regression analysis on organization resilience for each time period the sample was taken. This determined which factors have a significant effect on the prediction of the organization's resilience score. From the literature review, the three high reliability factors of most interest were learning goal orientation, cohesion, and specifically psychological safety due to its repetition of occurrence.

To check for multicollinearity, the six factors affecting organization resilience were tested for correlation (Figure 3). The independent variable cohesion was found to have near perfect correlation with the dependent variable organization resilience; therefore, the variable cohesion was removed from the regression model.

Figure 3.   Correlation Matrix for the Two Sample Periods

March 2015

	ores	psysafe	coh	learn	ident	prodj	lead
ores	1.0000						
psysafe	0.5058	1.0000					
coh	0.9954	0.5006	1.0000				
learn	0.3881	0.2245	0.3946	1.0000			
ident	0.4224	0.3687	0.4435	0.3102	1.0000		
prodj	0.4609	0.4779	0.4622	0.1059	0.5632	1.0000	
lead	0.6789	0.3994	0.6844	0.4512	0.4945	0.4596	1.0000

October 2015

	ores	psysafe	coh	learn	ident	prodj	lead
ores	1.0000						
psysafe	0.6562	1.0000					
coh	0.9949	0.6635	1.0000				
learn	0.2228	0.3491	0.2308	1.0000			
ident	0.5172	0.4572	0.5324	0.3943	1.0000		
prodj	0.5646	0.6696	0.5876	0.4442	0.5267	1.0000	
lead	0.5523	0.4450	0.5539	0.1556	0.3748	0.4652	1.0000

The variables for organization resilience and cohesion were found to have greater than 99% correlation in the data sets.

The following regression model for *Hypothesis 1* was run on both sample data sets to determine which factors were significant indicators of organization resilience:

$$ORes = \alpha + \beta_1 Psysafe + \beta_2 learn + \beta_3 ID + \beta_4 prodj + \beta_5 lead + \beta_6 X + \varepsilon$$

Where, *ORes* = organization resilience score is the dependent variable; and the independent variables are *Psysafe* = psychological safety score; *learn* = learning goal orientation score; *ID* = mean adjusted identification score; *lead* = mean adjusted leadership score; *prodj* = mean adjusted procedural justice score. To control for the differences across the organization the control variables of gender, age, education, and marital status is represented by the variable *X*. The error term is ε. This would, therefore, test the hypothesis that psychological safety was a significant predictor of organizational resilience.

There were two models to test if there were significant differences across the ranks with regards to psychological safety and the other independent variables of interest:

Hypothesis 2: Psychological safety is perceived equally across all the ranks.

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$$PsySafe = \alpha + \beta_1 rankE1\text{--}E3 + \beta_2 rankE4\text{--}E6 + \beta_3 X + \varepsilon$$

Hypothesis 3: The effect of the moderating factors on psychological safety is equal across the ranks.

$$PsySafe = \alpha + \beta_1 rank + \beta_2 xxx + \beta_3 rank\_xxx + \varepsilon$$

Where, *Psysafe* = psychological safety score; *rank* are the groups of E1–E3, E3–E4, and E7+ (the E7 and above group will be used as the reference group in hypothesis one); *xxx* = are the proposed moderating factors, which were identification, leadership, and procedural justice. To control for the differences across the organization the control variables of gender, age, education, and marital status is represented by the variable *X*. The error term is ε.

The term *rank_"xxx"* is the interaction variable of rank and the proposed moderating variable that determined if there was a significant relationship between the moderator (components of identification, leadership, and procedural justice) and the independent variable (rank). By centering each moderator's score on the mean score for the group, I was able to determine if there were positive or negative effects associated with each of the variables. Finally, *Hypothesis 3* was run independently for the ranks of E1–E3 and E4–E6.

IV. RESULTS

A. OVERVIEW

The first hypothesis tested which factors were significant predictors of organizational resilience, specifically psychological safety. The second hypothesis tested the effects of rank on psychological safety and the third hypothesis tested for moderating factors on psychological safety and rank. After analyzing the raw data it was determined there were resilience factor differences across the ranks of the organization. While running the regression analysis, it was confirmed that identification was a significant moderating factor on psychological safety and rank, which ultimately affects the organization's level of resilience. Since identification was subdivided into four separate categories, an additional model was constructed to determine if any of these subdivisions were responsible for this moderation effect. If one or more of these identification categories were found to be significant, the organization would be able to better understand how to improve the organization's psychological safety and reliability through this moderating factor.

B. RESULTS

By looking at the individual components of the high reliability model in Figure 4, the responses indicate that the U.S. Navy vessel has a high degree of learning goal orientation, cohesion, and psychological safety, which correlates highly with an HRO culture. The bottom three categories of leadership, identification, and procedural justice are also important in an HRO because it develops a collective mind and aligns the individual's goals with the organization. By further analyzing these six individual components and how they relate to the organization's resilience will reveal areas of needed improvement to support an HRO culture.

Figure 4.   Survey Results by Component
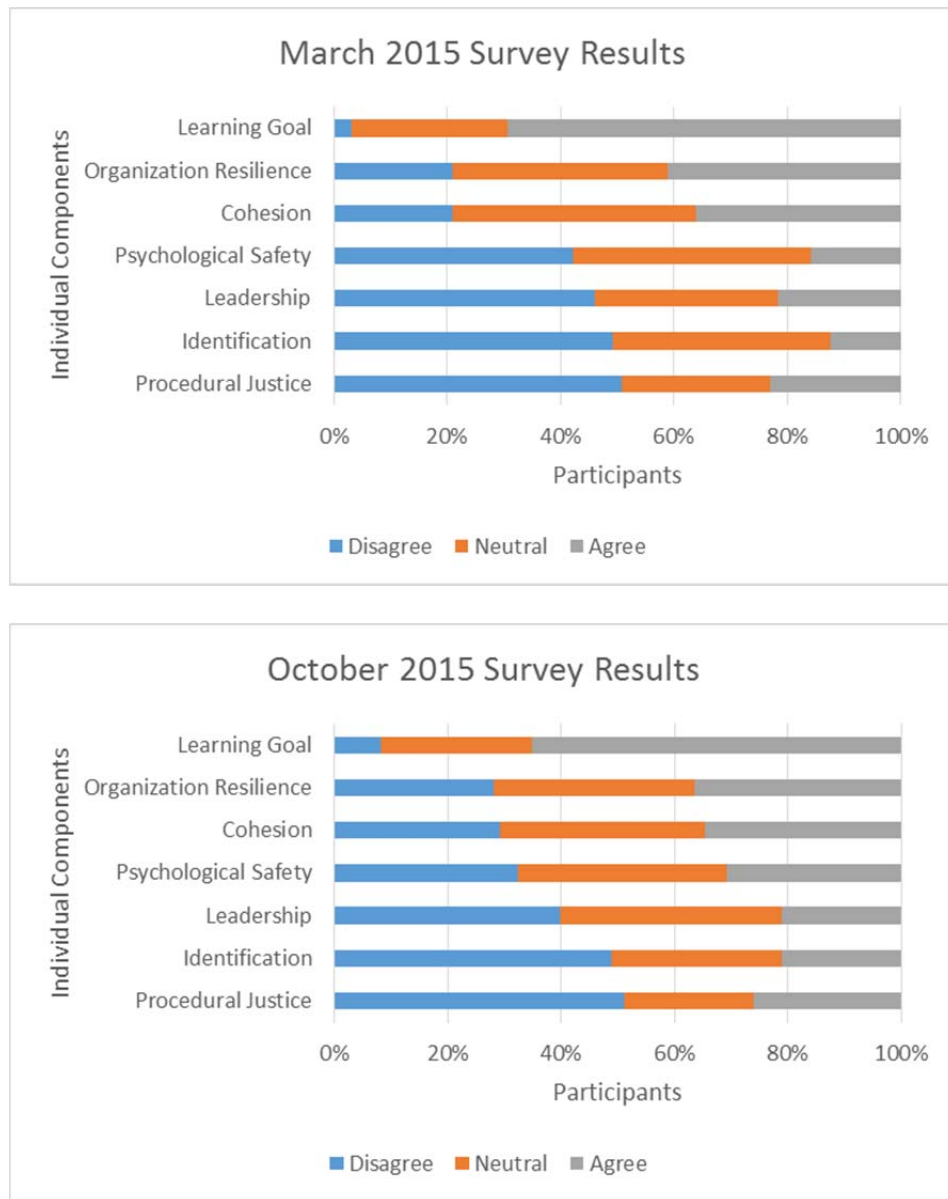
Displayed are the average survey responses displayed across the individual components that contribute to the organization's level of reliability. The ranking remained the same across the two time periods and sample groups.

Table 3 illustrates the results from the organization resilience regression model. Psychological safety was found to be a significant indicator of organization resilience and was an area of focus for this project (others being cohesion and learning goal orientation). The other factors that were found to be significant indicators of organization resilience in this survey data were identification and leadership. During the earlier analysis of the data

for trends, it was determined there were differences of perception across the ranks in cohesion, psychological safety, procedural justice, leadership, and identification. Since cohesion was found to be highly correlated with organization resilience and removed from the model, the remaining factors were analyzed across the ranks.

Table 3.   *Hypothesis 1* Parameter Estimates

Variables	March 2015 Data	October 2015 Data	Combined Data
Psychological Safety	0.238** (0.100)	0.409*** (0.091)	0.329*** (0.067)
Learning Goal Orientation	0.154 (0.097)	-0.112 (0.081)	0.018 (0.059)
Identification	0.037 (0.085)	0.210*** (0.075)	0.137** (0.055)
Procedural Justice	0.091 (0.081)	0.081 (0.074)	0.079 (0.052)
Leadership	0.654*** (0.113)	0.359*** (0.098)	0.470*** (0.071)
Standard errors in parentheses ***** p<0.01, ** p<0.05, * p<0.1**			

When discussing the significant predictor of organization resilience and possible moderator of psychological safety, leadership directly affects the group's effectiveness in a HRO. This affect is shaped by the differing degrees of interpersonal trust, mutual respect, and procedural justice (Edmondson, 1999, p. 355). The impact of leadership can also be managed through the utilization of relational coordination and supportive relationships improving the organization's effectiveness.

Another possible moderating factor of psychological safety is procedural justice. Although it was not found to be a significant predictor of organization resilience, when procedural justice is present, individuals are more willing to conform to the organization's climate and culture. In an HRO, procedural justice is needed because the individual's perception of the leader's legitimacy influences their willingness to comply (Colquitt, 2001, p. 388), which directly affects the organization's reliability.

The final significant predictor of organization resilience and possible moderator of psychological safety is identification. Identification enables an individual to feel

valued and further build psychological safety. Edmondson (1999) claimed the quality of the social processes and procedures in place are improved when the individual feels valued (p. 355). Each of these categories—procedural justice, leadership, and identification along with rank—was further analyzed on how it relates to the organization's psychological safety score, which had the lowest mean of the three key HRO traits.

The results of the second regression analysis for the 228 crewmembers showed that there was indeed an effect associated with rank. For *Hypothesis 2*, the effect of rank on psychological safety regression yielded a p-value of 0.013 for the ranks of E1–E3 and 0.003 for the ranks of E4–E6. Therefore, I was able to reject the null hypothesis at the 5% significance level because the p-value was less than 0.05, and conclude that rank did have an effect on psychological safety for this organization. The coefficients were negative for both groups and the regression results confirmed the negative findings visually observed during the survey data trend analysis. A series of regression models was then performed to determine how psychological safety was affected by rank and if the other factors of leadership, identification, and procedural justice were moderating factors.

1. Moderating Factors

For *Hypothesis 3*, the ranks of E1–E3 and E4–E6 were run independently with each proposed moderating factor, identification, procedural justice, and leadership on psychological safety. The interaction term of identification and rank returned a p-value of 0.329 for the ranks E1-E3, therefore the null hypothesis was accepted stating there was no moderating effect. For the ranks of E4–E6, the p-value was 0.031. Therefore, I was able to reject the null hypothesis at the 5% significance level and conclude that identification did indeed have a moderating effect on the ranks of E4 to E6 and psychological safety. Since identification was subdivided into four categories, there was an opportunity for additional analysis of the origins of this variance.

For the ranks of E1-E3, the p-value for the interaction term with procedural justice was 0.230 and leadership was 0.554. For the ranks of E4–E6, the p-value for the interaction term with procedural justice was 0.947 and leadership was 0.738. Hence, the

null hypotheses were accepted for all of the above p-values at the 5% significance level and conclude that procedural justice and leadership did not have a moderating effect on psychological safety and rank. The results of the regression models are shown in Table 4.

Table 4.   *Hypotheses 2 and 3 Regression Parameter Estimates*

Variables	*Hypothesis 2.* **Psychological Safety**	*Hypothesis 3.* **Interaction term of Identification**	*Hypothesis 3.* **Interaction term of Procedural Justice**	*Hypothesis 3.* **Interaction of term of Leadership**
E1 to E3	-0.880** (0.350)	-0.182 (0.151)	-0.101 (0.086)	-0.848 (0.143)
E4 to E6	-0.934*** (0.314)	-0.240** (0.110)	0.006 (0.083)	-0.485 (0.145)
Standard errors in parentheses ***** p<0.01, ** p<0.05, * p<0.1**				

2.   Additional Analyses

The main goal of this project was to determine which individual factors had a significant impact on organizational resilience and high reliability. Once there was a discovery of identification as a moderating factor for the ranks of E4–E6 on psychological safety, a new regression model was generated as an opportunity to narrow the findings.

Hypothesis 4: The identification subdivisions have a moderating effect on the relationship between psychological safety and rank.

$$PsySafe = \alpha + \beta_1 rankE4–E6 + \beta_2 ID\_\text{"xxx"} + \beta_3 rankE4–E6\_ID\_\text{"xxx"} + \beta_4 X + \varepsilon$$

Where, the term *"xxx"* are the subdivisions of 1) identification with the Navy, 2) as a sailor, 3) with the individual's division, and finally 4) with the individual's leader. Each regression was run with one of these four subdivisions of identification. Identification with the Navy and identification with the individual's leader produced a p-value of 0.107 and 0.125 respectively. Thus, I was unable to reject the null hypothesis at the 5% significance level and conclude a moderating effect was not present. The classifications of identification as a sailor and identification with their division generated

the p-values of 0.013 and 0.009 respectively. Consequently, I was able to reject the null hypothesis at the 5% significance level and conclude that the components of identification as a sailor and identification with their division had a moderating effect on psychological safety and rank. Of special note, this regression model revealed that there were significant effects on psychological safety across the demographics with respect to identification. Females, Hispanics, and single sailors experienced a lower level of psychological safety than their peers. The results of the regression model are shown in Table 5.

Table 5.   *Hypothesis 4* Regression Parameter Estimates

Variables	Psych Safety and Identification with Navy	Psych Safety and Identification as Sailor	Psych Safety and Identification with Division	Psych Safety and Identification with Leader
E4 to E6 Interaction Term	-0.153 (0.094)	-0.239** (0.096	-0.247** (0.094)	-0.157 (0.102)
Male	0.308* (0.177)	0.282 (0.184)	0.255 (0.167)	0.296* (0.173)
Hispanic	-0.485* (0.247)	-0.513** (0.260)	-0.420* (0.237)	-0.434* (0.244)
Single	-0.249 (0.161)	-0.328** (0.165)	-.0115 (0.155)	-0.227 (0.157)
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				

The regression analysis revealed that identification had a moderating effect on psychological safety for the ranks of E4 to E6 within the organization. Figure 5 shows the combined identification survey scores for the ranks of E4 to E6 over time onboard the ship. As the individuals spent more time onboard their identification responses became more negative, which could be attributed to the individuals' time spent in the shipyard during a planned incremental availability period.

Figure 5.   Combined Survey Results for E4–E6 Identification
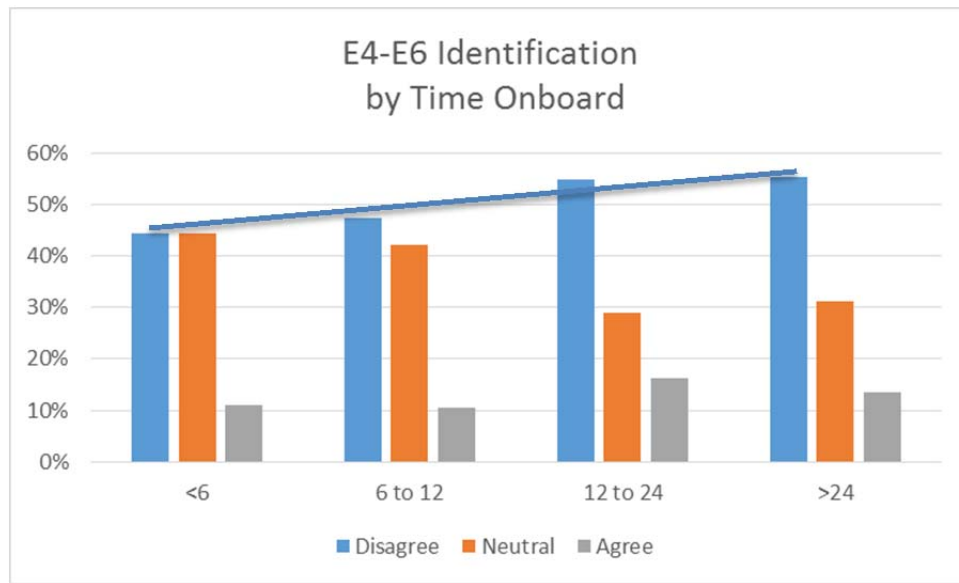
An increasingly negative response over time indicates a decreased sense of identification over time for the ranks of E4 to E6 within the organization.

The subdivided identification components of identification with their division and as a sailor were the two components that showed moderating effects of significance on psychological safety and the ranks of E4 to E6. This may be due to two possible reasons. The ranks of E4 to E6 are middle management ranks. For these individuals, there are often feelings of ambivalence when functioning within their division. There is a yearning for acceptance and mutual support within their peer group; and conversely, there is a transition to the leadership role and a need for separation to establish the new role identities. This ambiguity in role confusion, also described by Bartone (2006), is a stressor on military resilience (p. 134). Secondly, the ranks of E4–E6 are also possible transition ranks to the civilian sector. Most terms of enlistment range from four to six years. By the end of their first or second term, the individuals will have achieved the ranks of E4 to E6. The decision then becomes whether to remain in the military and be a sailor, or transition to college as a student, or transition to the civilian workforce as laborer. This impending transition may explain the increasingly negative identification scores as time progresses onboard the ship because the individuals are also nearing the completion of their enlistment contract adding to the ambiguity.

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V. CONCLUSION AND RECOMMENDATIONS

A. CONCLUSION

A commitment to resilience is achieved through an intense knowledge of the worker's attitudes, experiences, and skills within the organization (Weick and Sutcliffe, 2001, p. 14). In order to understand the worker's attitudes and perceived experiences, an HRO must be able to create a climate of psychological safety. Psychological safety refers to one's comfort level with another's response and the belief they would mutually accepted when they ask a question or give feedback on a subject (Carmeli & Gittell, 2009, p. 712). When facilitating a culture of high reliability, supporting the individual's roles through the acceptance of diversity, sharing of resources, and commitment are some of the characteristics in which groups of individuals build mutual respect and trust (Cacioppo et al., 2011, p. 46). When a relationship is without mutual respect and trust, high levels of psychological safety cannot be achieved. Therefore, the organization's level of high reliability is relational in nature. It is socially fabricated by the quality of the relationship between a relying individual or group and the relied upon individual or group (Busby & Iszatt-White, 2014, p. 70).

By analyzing the system dynamics of this project's organization a picture of reliability and resiliency began to emerge. When supporting a culture of high reliability, the factors of psychological safety, cohesion, and learning goal orientation are at the center of examination. The survey data analysis showed that the U.S. Navy vessel already had high levels of learning goal orientation and cohesion. The organization resilience regression model revealed that psychological safety, identification, and leadership were all significant predictors of the organization resilience score. Being that psychological safety was one of the high reliability factors of interest, various multiple regression models were developed to search for possible moderating effects on this variable across the ranks. The components of leadership, identification, and procedural justice were used as the moderating variables. By understanding how these three factors of the high reliability model interacted with psychological safety, I was able to determine which factors aid or hinder psychological safety. Psychological safety and all three possible

moderating factors were also found to have noticeable trends across the ranks during the survey data visual analysis.

The results of the data and regression analysis showed differing perceptions of resilience factors across the ranks. After narrowing the focus to potential moderating factors on psychological safety, it was discovered that the subdivisions of identification with their division and as a sailor showed moderating effects of significance on psychological safety for the ranks of E4 to E6. Sluss, van Dick, and Thompson (2011) argued that the individual's role identities have a significant influence on their attitudes, behaviors, and thought processes (p. 2). As Sluss et al. (2012) stated, identification aids in building team cohesion and assists in the aligning of the individual's goals with the organization's (p. 955). As a leader in a HRO, it is important to understand the group's relationships, social support systems, and understand the mediating pathways that affect the organization's resilience (Feeney & Collins, 2015, p. 4).

In order to enhance organization resilience, the process of designing programs that enhance organization resilience requires rethinking the individual's capacities in a fundamentally different way. The interventions that promote resilience need to be designed "to build adaptive social ecologies for people, groups, organizations, and communities" (Cacioppo et al., 2011, p. 46). Cacioppo et al. (2011) and Gittell (2008) reminded us that resilience is an interdependent, relational construct that generates social capital that sustains and promotes positive relationships (p. 43, p. 30). Without a culture that supports and maintains individual and group resilience, high levels of reliability are difficult to achieve. Van Gorder (2013) also emphasized that a "culture is not created by memo or edict from the board of executive leadership. Real culture comes from the middle of the organization" (pp. 26–27). As discovered in this projects regression analysis, these "middle" individuals, the E4s, E5s, and E6s, lacked identity in their culture and therefore had lower levels of psychological safety.

The role of a culture is to act as a social control system. It promotes and reinforces the desired behaviors and hinders the inappropriate behaviors (Watkins, 2013). Schein (2004) suggested that culture arises from three main sources: founder's beliefs and values, the development of the organization's learning process, and the introduction

of new member's beliefs and values from outside the organization (p. 219). In order to foster change, the organization needs to develop a sense of crisis surrounding these findings. This can be done through the recognition of past failures or a decline in performance. Furthermore, there needs to be an understanding that the old beliefs and values have broken down (Schein, 2004, p. 287).

B.   RECOMMENDATIONS

Positive organizational resilience is created through the processes that efficiently utilize and combine social resources (Sutcliffe & Vogus, 2003, p. 104). In a psychologically safe environment individuals are more willing to engage in dialogue and openly discuss their opinions (Edmondson, 2008, p.5). In doing so, the individual gains knowledge and the skills to build social capital. An environment of psychological safety fosters a social climate and social embeddedness, which enables individuals to share information freely without fear of rejection. (Jex et al., p. 70).

The first recommendation is to determine which groups of individuals have high levels of interdependence and communication. Assign new personnel to these successful workgroups and allow individuals to learn while observing others. By experiencing positive work practices "in successful, or elite groups, may create a self-fulfilling prophecy" (Everly, 2011). Schein (2004) also labeled this activity as the use of positive role models that allows the learner to observe the new behavior (p. 306). This also allows the others in the group to learn collectively and further advance their own social capital. After a period of time the individual will then be moved to their new permanent team if needed. The individual then spread's this positive resilient culture and a new level of collective efficacy will be achieved along with added social capital.

In organizations desiring high reliability, the encouragement of error and failure reporting are viewed as opportunities for learning. A quality of HROs is the ability to swiftly identify errors and process the findings (Weick & Sutcliffe, 2001, p. 57). A high reliability organization creates a conduit for individuals to openly communicate, through psychological safety, and "encourages members to call attention to failures and to

actively monitor and challenge each other's actions and thought processes" (Carmeli & Gittell, 2009, p. 712).

The second recommendation is the development of a "good catch log." A good catch log is a public recognition of potential pitfalls and potential areas for improvement. By utilizing a good catch log, leaders will promote and support an environment through psychological safety and mutual respect that enhances the knowledge base and increases the reliability of the organization (Carmeli & Gittell, 2009, p. 715). Once a month, a public recognition award should be given to the most significant "catch." This creates a sense of value for the individual and adds to the individual's identification with the organization. Jex et al. (2013) found that organizations who value their members have shown to be more successful those without such cultures. "The reason for such findings may be that such supportive organizational cultures facilitate resilience in organizational members" (p. 73).

## C.   RECOMMENDATIONS FOR FUTURE STUDIES

This study's regression model showed the factors of psychological safety, identification, and leadership were significant predictors of organization resilience. The two components of psychological safety and identification were explored in depth in this paper's regression analysis. Future studies could further analyze the different aspects of leadership and its potential moderating effects on organization resilience.

Another potential consideration is the expansion of the current high reliability model to include additional factors. This will allow the discovery of additional moderating factors on the key HRO factors of learning goal orientation, cohesion, and psychological safety. Also, an assessment of the individual demographics could reveal if there are any significant moderating factors with regards to gender, ethnicity, marital status, and education. By understanding which groups are in need of increased levels of social capital and resilience would allow the organization to improve its level of reliability.

# APPENDIX. SURVEY DATA BY RANK AND TIME ONBOARD

The organization's resilience score for the October survey averaged 4.50 (SD = 1.27). In Figure A.1, there was no noticeable trend in the March data over time onboard, however in the October data there was a less negative response in the sample group's opinion as the individual spent more time onboard. The data also showed that the ranks of E7 and above have higher resilience scores than the lower ranks, which may be a result of higher perceived levels of cohesion and psychological safety. These along with the other individual factors of the high reliability model were regressed on organization resilience to determine if there were any significant findings related to the model.

Figure A.1   Organization Resilience Survey Results
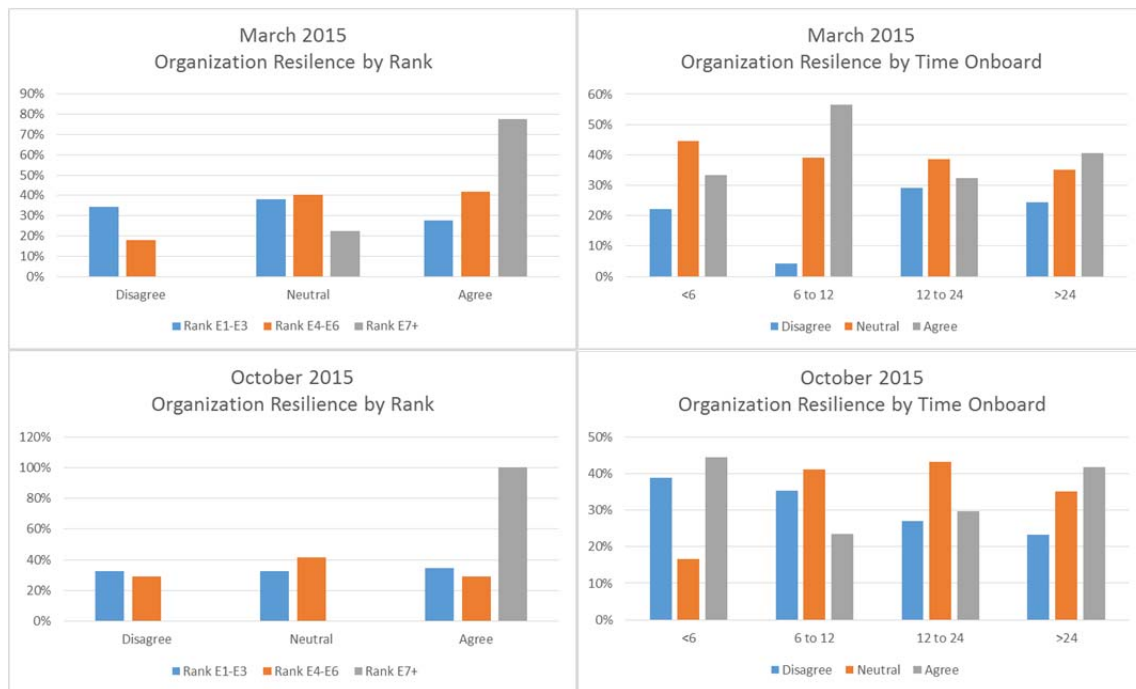
The individual's average response for learning goal orientation was 5.27 (SD = 1.16) and was the strongest component on the most recent survey in October. This trait comes natural to many military organizations due to the perpetual turnover rate and countless promotions. This learning trait is also essential to maintaining the structure of an HRO by encouraging information sharing and opportunities for improvement. By distinguishing the category of learning goal by rank and time onboard, found in Figure A.2, the individuals agree approximately 65% on average that the organization's learning culture supports the individual's enthusiasm for learning and is likewise reinforced by the chart of time onboard.

Figure A.2   Learning Goal Orientation Survey Results
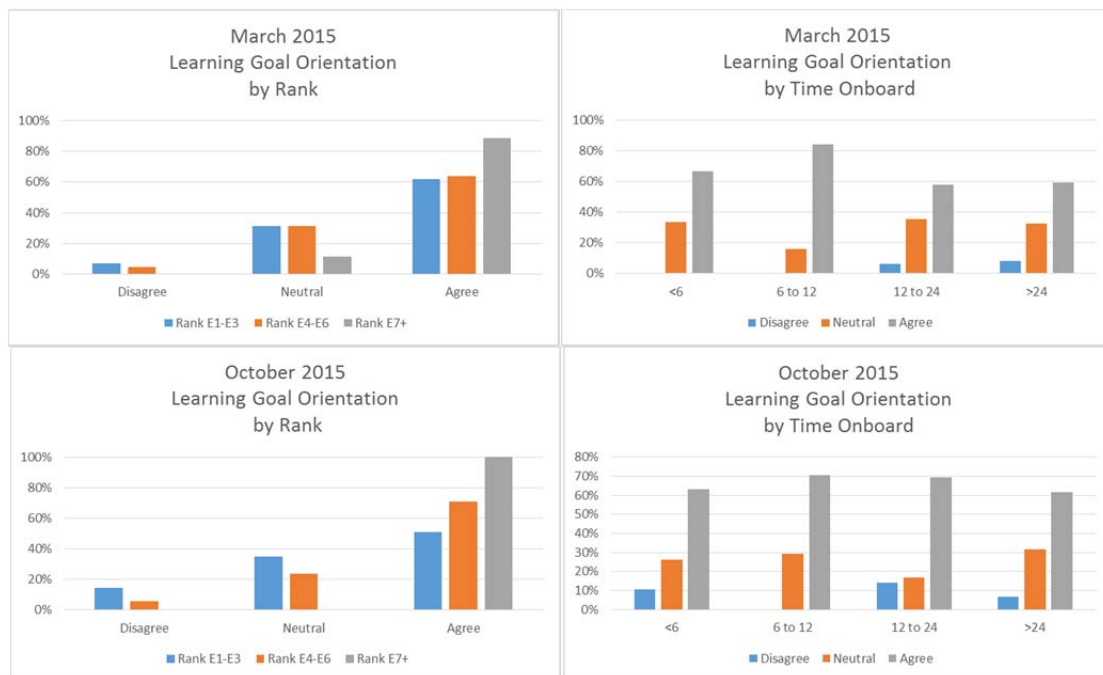
The individual's average response for cohesion was 4.48 (SD = 1.28) on the October survey. As displayed in Figure A.3, the dispersion across the lower enlisted ranks is unbiased unlike the leadership responses, E7 and above, which were positively biased. A leadership positive bias was also found the March survey. This fact may be shaped by the leaders' desire to show only positive functionality within their division. With regards to time onboard, there are no noticeable trends to this response. The cohesion section of questionnaire focuses on the commitment to one another within the division and the resulting performance aspects. A negative response by leadership may indicate a possible failure in their ability to lead.

Figure A.3   Cohesion Survey Results
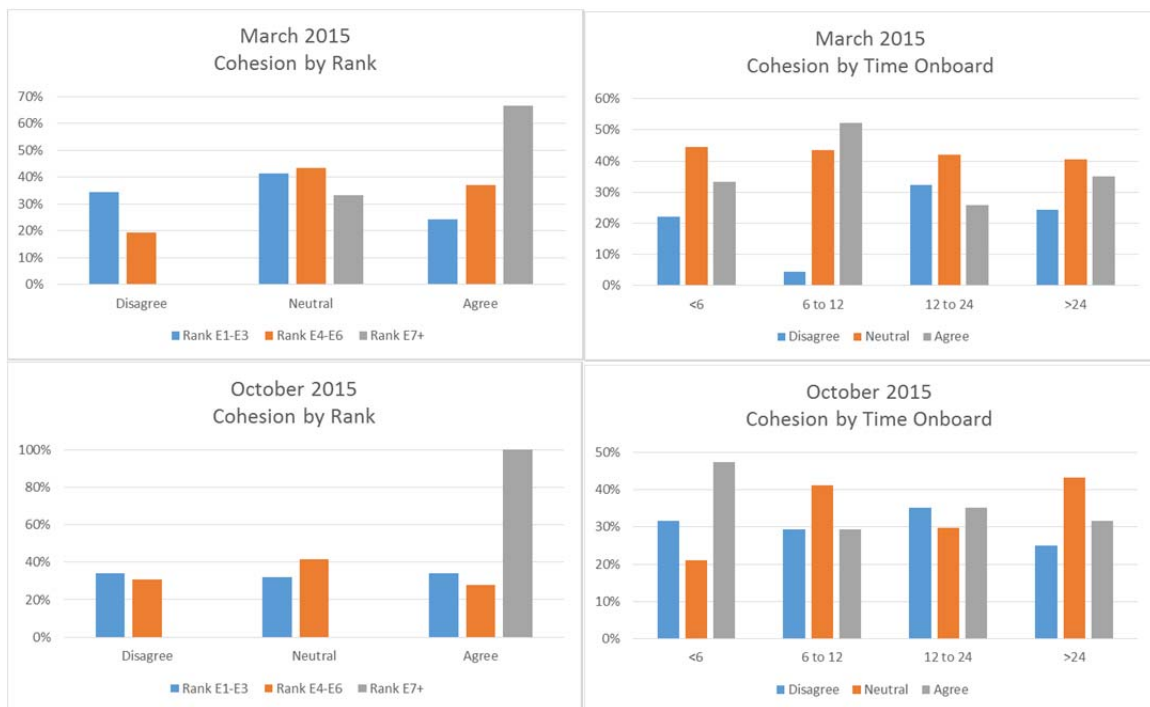
The individual's average response for psychological safety was 4.30 (SD = 1.23) on the October survey. By observing the psychological safety category by rank in Figure A.4, there was an indication that the lower enlisted ranks, E1 to E3 and E4 to E6, may not have as high of perceived psychological safety as the leaders, E7 and above. This bias was also found in the March survey though not as strong. Psychological safety improves over time onboard in the March survey, however this is not reflected in the October results.

Figure A.4   Psychological Safety Survey Results
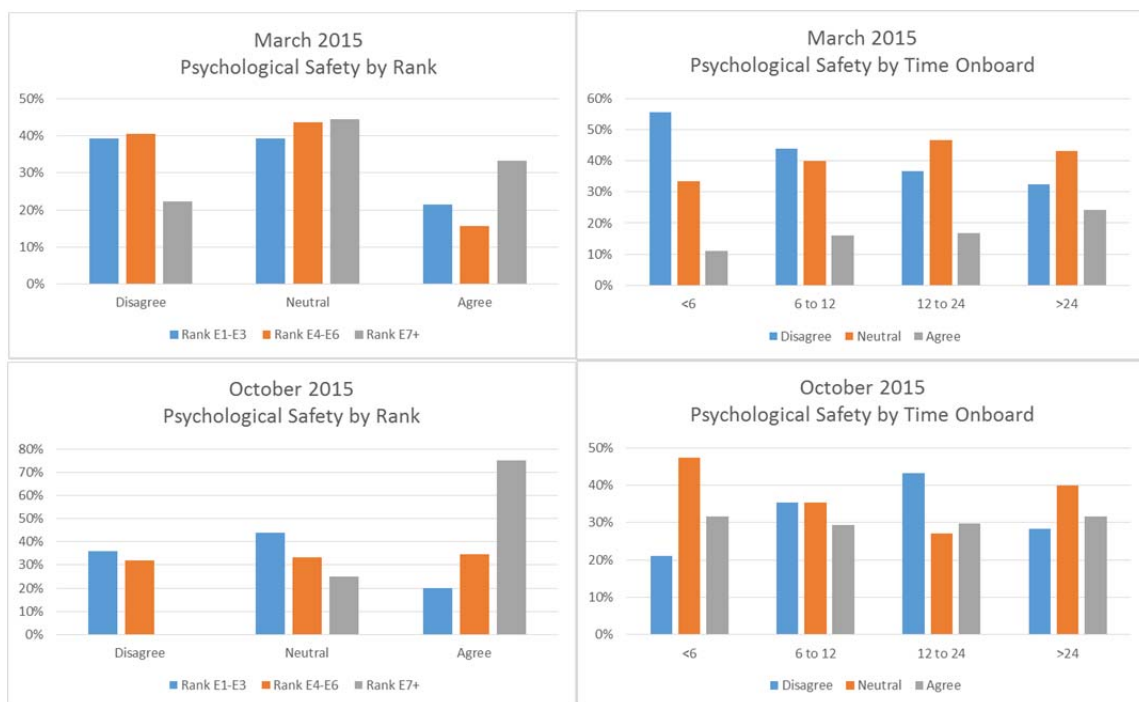
The individual's average response for leadership was 4.24 (SD = 0.99) on the October survey. Presented in Figure A.5, there was a noticeable trend in the perception of leadership found in the October results with regards to rank. Leaders, E7 and above, were positively skewed and may be contributed to the same fact as stated for cohesion, in contrast to the middle level managers, E4 to E6, which were negatively skewed. This bias was also found in the March survey though not as strong, and there were no noticeable trends with regards to time onboard.

Figure A.5   Leadership Survey Results
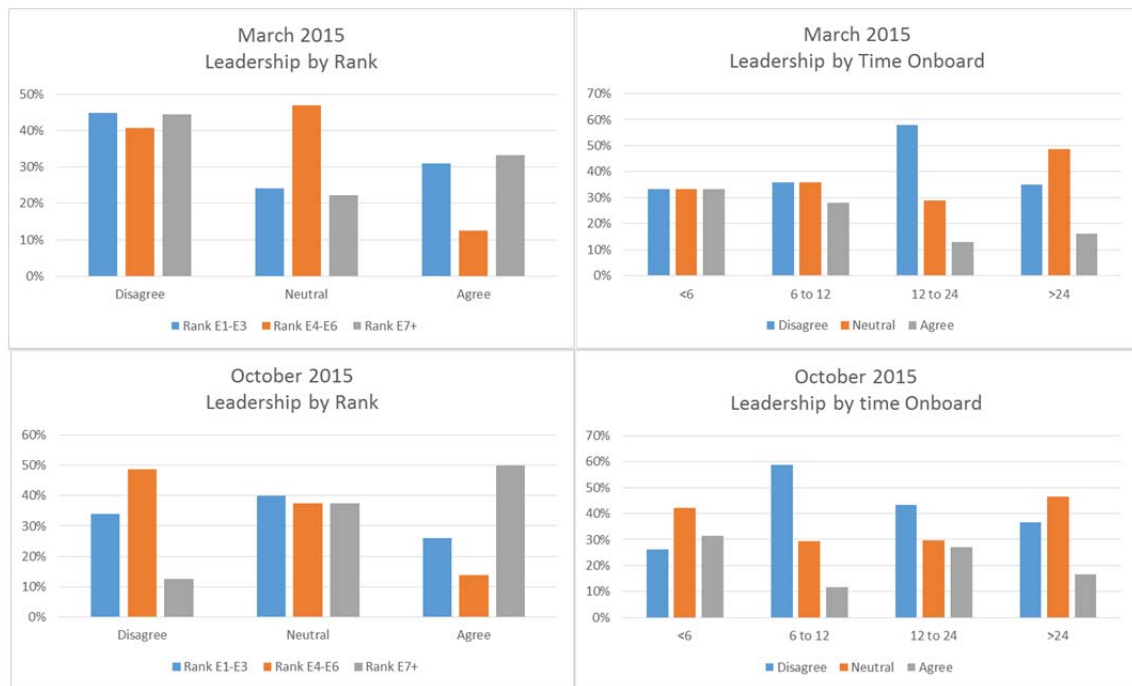
The individual's average response for identification was 3.90 (SD = 1.30) on the October survey. There was a negative bias for identification on the time onboard chart in the Figure A.6. This bias was not found on the March survey, however there were more individuals that disagreed with the proposed statements than agreed. There were differences noted across the ranks in the October survey, however this was not replicated in the March results. As discussed by Sluss, Ployhart, Cobb, and Ashforth (2012), identification aids in building team cohesion and assists in the aligning of the individual's goals with the organization's (p. 955).

Figure A.6   Identification Survey Results
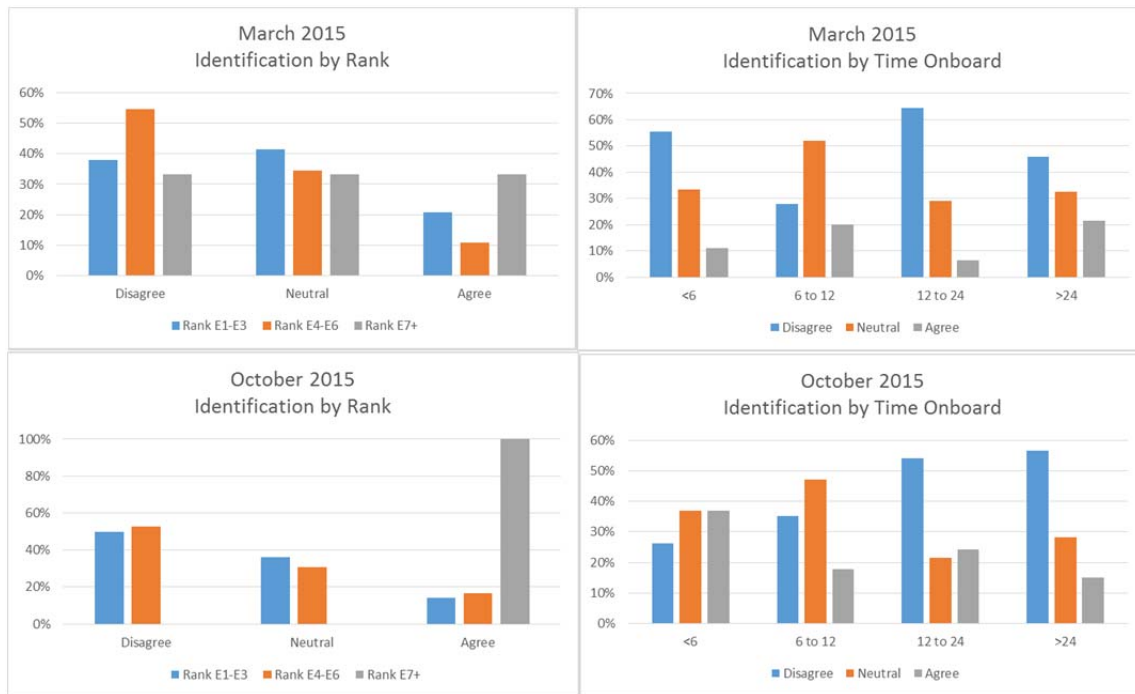
The lowest of all the individual's average responses was the category of procedural justice, which averaged 3.88 (SD = 1.62) on the October survey. In Figure A.7, there were no noticeable trends in the March data and the October data did not reveal any trends over time onboard. However, there was a distinct relationship found across the ranks in the October data.

Figure A.7   Procedural Justice Survey Results
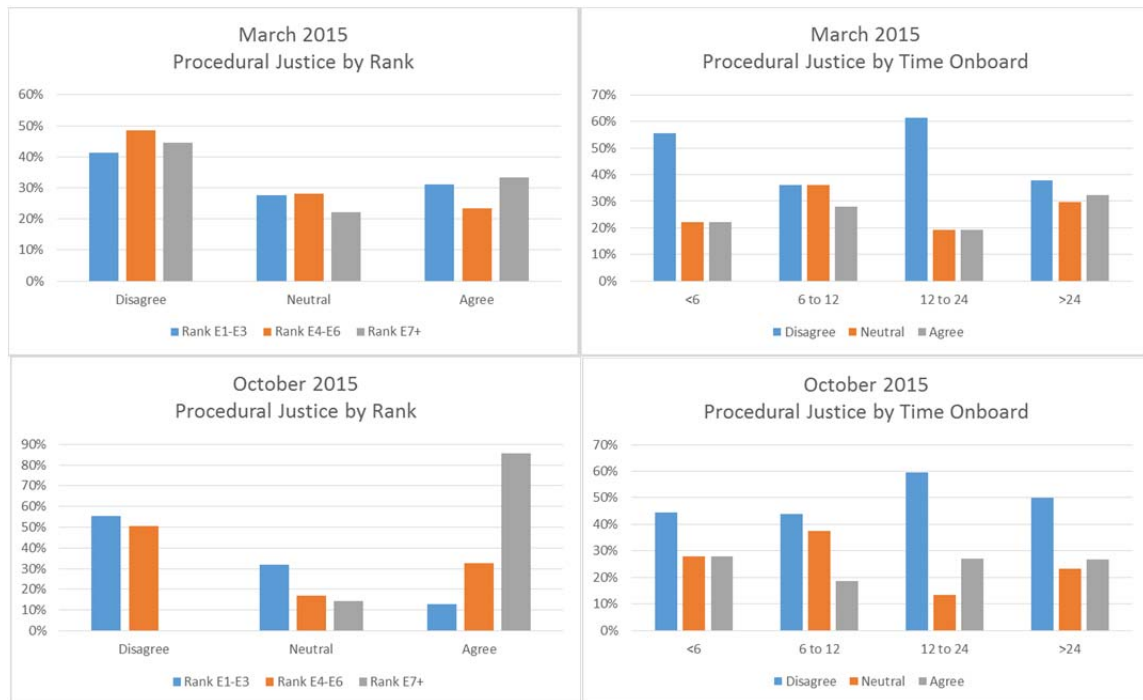
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